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PROVISIONAL SPECIFICATION.

Improvements in Balloon Envelopes and the like to Prevent Diffusion of Gases.

I, JOHN HARGER, of Grange Hollies, Gateacre, in the County of Lancaster, Chemical Engineer, do hereby declare the nature of this invention to be as follows:—

This invention has for its object a compound membrane or septum which will prevent diffusion of gases, and it consists essentially in two or more coatings, one of which at least has the tensile strength required, and the other is any suitable liquid or semi liquid in which air, hydrogen, or other gases to be confined or separated from each other are insoluble or nearly so, and do not react thereon. In practice I prefer to form the compound membrane of two layers of any material at present used for making balloons which is liquid tight, and place between these materials the liquid. The liquid can if desirable be exceedingly adhesive or viscid, such for instance as a non-drying varnish, prepared non-drying tar or non-drying solution of rubber, and in any case the membrane must be impervious to the liquid and not injuriously acted upon by it. Where the membrane is required to keep the gases separate for a very long time, it may be desirable to have three or more layers of material with two or more liquids, one of them absolutely insoluble in the other, and the outside one unacted on by the air, the inside one unacted upon by the gases protected and enclosed, or one material can be saturated with a greasy compound and the other with an aqueous or other liquid insoluble in the grease. In speaking of the membranes proper I may use prepared silk, gold-beaters skin or other like membrane or other close textile fabric.

A pipe or pipes with means for stopping up same may be inserted through one material and attached to it so that the liquid may be introduced or let out partly from between the materials if required.

In carrying out my invention, in actual practice I prefer to have waterproof or liquid proof seams at intervals preferably running in a horizontal direction, thus separating the liquid into numerous portions, especially vertically in order to prevent the liquid from gradually collecting at the bottom, and leaving the top and sides dry or unprotected.

Dated this 21st day of July, 1910.

For the Applicant,

WM. P. THOMPSON & Co.,
6, Lord Street, Liverpool.

COMPLETE SPECIFICATION.

Improvements in Balloon Envelopes and the like to Prevent Diffusion of Gases.

I, JOHN HARGER, of Grange Hollies, Gateacre, in the County of Lancaster, Chemical Engineer, do hereby declare the nature of this invention and in what
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manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to membranes or septums for balloons and the like and consists of means for preventing the diffusion of gases to a very much greater extent than hitherto. 5

Up to the present time the material for balloons has consisted of a layer of silk or the like varnished or treated with rubber solution or similar substance to close the pores of the fabric. It has also been suggested to use two thicknesses of silk cemented together by means of an adhesive substance having a solution of india-rubber or gutta percha as a base in order to make the material gas-tight. 10

In such cases however the coating develops a large number of fine cracks either as a result of shrinkage or chemical changes or as a result of repeating flexing or expansion and contraction of the material. In this way the coating becomes more or less porous and allows the light hydrogen to diffuse rapidly through the membrane into the surrounding air. 15

According to the present invention the fabric is used merely as a support for one or more layers of non-drying liquid, the liquid acting as the gas retaining member. The liquids used need not necessarily be very fluid and may be extremely viscous provided that they are sufficiently liquid to form a continuous layer which will not break when the material is bent or folded. 20

Further the liquids or semi-liquids must be such that the air hydrogen or other gases to be confined or separated from each other are insoluble or nearly so in them. Where there are two such liquids arranged between layers of fabric these two are preferably not soluble the one in the other. 25

In the simplest arrangement, the compound membrane consists of two layers, the outer layer being of prepared cotton, silk or the like, and the inner of an extremely viscid material of the character described. The plan I prefer however is to make the compound membrane of two layers of any substantially liquid-tight material, the two layers of material may be different as at present used for making balloons, one only is required to be strong, and place between these materials the liquid or semi-liquid, in such case using preferably a liquid like calcium chloride solution in which hydrogen is almost insoluble or an exceedingly adhesive or almost insoluble or viscid material, such for instance as a prepared non-drying tar such as petroleum tar, but in any case the membrane should be as impervious as possible to the liquid and be not injuriously acted upon by it. For instance a very simple arrangement can be two layers of varnished or oil-cotton or silk, with a saturated solution of calcium chloride between. In this case the two layers are preferably united at intervals preferably in zonal lines by an adhesive such as rubber or by sewing or the like. 30
Where the membrane is required to keep two gases separate for a very long time, it may if desirable have three or more layers of textile material with two or more liquids or semi liquids, one of these being insoluble in the other, the outside one of these being unacted on by the air and the inside one unacted upon by the gases protected, and enclosed. Thus one material may be saturated with a greasy compound and the other with an aqueous or other solution insoluble in the greasy compound. As membranes I may use either prepared cotton, silk, or other like membrane or close textile fabric or thin aluminium sheet such as are well known and ordinarily used in balloon manufacture. A pipe or pipes with means for stopping up the same may be inserted through one material and attached to it so that the liquid may be introduced between it and the next material. In actual practice the balloon is built up with its two or three layers of textile or other material, and if there be three layers, with one tube or set of tubes opening out between the first and second layer, and another tube or set of tubes opening out between the second and third. 35
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The two or three materials are stuck or sewn together at intervals or in zones so as to prevent the liquid materials sinking to the bottom, and the liquids pumped in and allowed to spread all over the surface, all air bubbles being carefully extracted by vacuum or otherwise. The balloon is then inflated to its fullest size, the tubes being left open so that the majority of the liquid can be forced out again, leaving the surfaces entirely covered with a thin film of liquid or adhesive coating, free as far as possible from air-bubbles. Or prior to inflating the balloon, the liquid materials are successively pumped in and carefully spread all over the surface by rubbing, rolling or the like. Where however there are seams dividing the balloon into a large number of zones, means must be employed for filling each space between the various divisions, the air between being removed preferably by vacuum.

It is to be understood that I do not limit myself to the use of such compound material or materials for balloon making only but claim the use of such for gas tubing, gas holders, breathing bags and the like, which may be collapsible.

I am aware that it has been proposed to use a mixture of glycerine and glue in such proportions that it is deliquescent for treating flexible gas pipes made of intestines in order to keep the same moist and supple and thus prevent it from cracking and splitting as a whole, but the present invention relates to the use of a liquid or deliquescent substance to form a coating for a woven material which will not develop fine cracks and not to prevent fracture of the material as a whole.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. The improvement in the manufacture of balloons or other gas proof envelopes which consists in the use of silk prepared cotton, or the like as a support for a film of non-drying liquid which acts as the gas retaining member, substantially as described.
2. The use of zonal divisions, substantially as and for the purposes described.
3. The process of coating the internal surfaces of compound septa for balloons and the like with adhesive liquid films or layers substantially as described.

Dated this 21st day of January, 1911.

For the Applicant,

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